

REMARKS

Claims 2-4 and 8-12 are all the claims pending in the application. Claims 1 and 5-7 have been previously cancelled. Claims 8 and 9 have been amended herein to better clarify the present invention. Thus, no new matter has been added herein.

Referring to pages 2-6 of the Office Action, Claims 2-4 and 8-12 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Japan Publication No. 2002-334895 to Sakuyama Seiki (English translation) (“Sakuyama”) in view of U.S. Publication No. 2002/0046627 to Amita et al. (“Amita”). Applicants traverse for the following reasons.

Independent Claim 8 is directed to a solder deposition method comprising the steps of forming a dam around an electrode on a substrate; applying a solder precipitating composition to said substrate; and heating the resulting substrate so as to deposit solder on the surface of said electrode, wherein said solder precipitating composition comprises a tin powder; and a complex of at least one member selected from the group consisting of silver ions and copper ions, and at least one member selected from the group consisting of aryl phosphines, alkyl phosphines and azoles.

Independent Claim 9 is directed to a solder deposition method comprising the steps of forming a dam around an electrode on a substrate; applying a solder precipitating composition to said substrate; and heating the resulting substrate so as to deposit solder on the surface of said electrode while heating said solder precipitating composition applied, wherein said solder precipitating composition comprises a tin powder and a salt of at least one metal selected from the group consisting of lead, copper and silver.

As further discussed below, neither Sakuyama nor Amita disclose a solder composition method wherein the solder precipitating composition comprises a tin powder, and a complex or salt of silver or copper ions, as recited in Claims 8 and 9. Sakuyama discloses a pewter paste that can be melted to form a layer. Accordingly, Sakuyama teaches an alloy. However, the solder composition recited in Claim 8 of the present invention is not an alloy, but rather a composition comprising a tin powder, a complex of silver and/or copper ions with at least one aryl phosphine, alkyl phosphine or azole, whereupon heating, the silver and copper ions in the complex, are transformed into copper or silver due to the ionization tendency, and then forms an alloy (Sn-Cu alloy or Sn-Ag alloy) to be deposited with the tin powder. Likewise, Claim 9 of the present invention is also not an alloy, but rather, a composition comprising a tin powder, and a salt of at least one metal selected from the group consisting of lead, copper and silver. By definition, an alloy cannot comprise a complex of the metal ions (as recited in Claim 8) and cannot comprise a salt (as recited in Claim 9). Sakuyama merely discloses an alloy and fails to disclose a composition comprised of a complex of silver and/or copper ions, as recited in Claim 8, and fails to disclose a composition comprising a salt, as recited in Claim 9. Thus, Sakuyama fails to teach or suggest the composition embodied by the present invention.

Moreover, in the present invention, in order to precipitate the solder composition to form a solder bump, the substrate is heated, a chemical reaction occurs, which subsequently causes the solder to precipitate, forming a solder bump. This is different from Sakuyama, which teaches that the pewter paste is heated, the pewter paste melts, thus forming a bump.

In this regard, the solder precipitating composition of the present invention advantageously enables the formation of bumps precisely on electrodes of fine pitch substrates, and also prevents the occurrence of voids as in the case of using a solder paste. *See specification*

of the present application at page 2, line 24 to page 3, line 1. Moreover, the Examples and Comparative Examples described in the specification of the present invention further make apparent the advantages of the method of the present invention. Namely, when using a solder paste as a solder composition mixing with Sn/Pb alloy powder (Sn/Pb 63/37, particle size: 20 pm) (similar to the pewter paste disclosed by Sakuyama) and flux (Comparative Examples 2 and 4), a void occurs in a solder bump (*see* Table 1). However, as shown in Examples 1-5, when the solder precipitating composition as recited in the present invention is used, a void does not occur in the solder bump.

As acknowledged by the Examiner, Sakuyama does not disclose that “at least one member selected from aryl phosphines, alkyl phosphines and azoles,” as recited in Claim 8. Amita is relied upon to satisfy the deficiencies of Sakuyama. In support, page 8, paragraph [0115] of Amita is relied upon in which it is asserted that “azoles may be further added to the flux.” However if the azoles are only added to the flux, the azoles do not react with solder powder (that is, a metal alloy), and do not form a complex. Furthermore, there is no description in Amita that azoles form a complex with silver ions or copper ions as claimed in the present application. Accordingly, neither Sakuyama, either alone or in view of Amita, disclose a solder precipitating composition of the present invention, where the composition comprises azoles in complex with a silver or copper ions, as recited in Claim 8 of the present invention.

Amita does not disclose a solder precipitating composition as pointed out at page 8, lines 10-17 in the Office Action, that is, the combination of a tin powder and a complex of silver and copper, or a combination of tin powder and a specific metal salt. Moreover, the examples disclosed in Amita of the metal composition for solder powder are ordinary solder alloys only. This is apparent from the disclosure in Amita that, “Specific examples of the above systems

include a eutectic solder” at paragraph [0064], lines 1-2, and “Such solder paste can have a lower reflow temperature” at paragraph [0065], lines 4-7. Accordingly the deficiencies of Sakuyama are not satisfied by the disclosure in Amita. In view of the above, the withdrawal of the rejections of Claims 8 and 9 are respectfully requested.

Claims 2-4 and 10-12 depend directly or indirectly from independent Claims 8 and 9, and are patentable over Sakuyama and Amita for at least the same reasons Claims 8 and 9 are patentable over the prior art.

Accordingly, withdrawal of the rejection of Claims 2-4 and 8-12 under §103 over Sakuyama and Amita is respectfully requested.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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